Going Beyond Material Issues

BY MARK GORGOLEWSKI, PH.D., DIP. ARCH., LEED AP

Steel's high ratio of recycled content isn't its only asset in the sustainability game.

IN RECENT YEARS the steel industry has made significant improvements in its environmental performance, such as reducing energy use in manufacturing steel, as well as reducing pollution and waste. Furthermore, some of the characteristics of steel as a material offer considerable opportunities for more sustainable ways of construction.

Nevertheless, when discussing positive aspects of sustainable steel in buildings, is seems that the focus inevitably turns to the material's recycling characteristics. These are clearly very significant and research has shown the clear environmental benefits of recycling steel and reusing steel components in construction. However, as the sustainability debate matures and as clients, designers, and contractors begin to want more comprehensive answers to questions about a material's green characteristics, the steel industry needs to develop a more holistic approach and stop hiding behind the positive, yet narrow, benefits of recycling.

The Leadership in Energy and Environmental Design (LEED) green building rating system provides multiple opportunities, besides recycling, for sustainability within the steel construction industry—where steel can help score points and where further development by the steel industry may offer further opportunities. In addition to LEED, it's also important for the steel construction industry to develop a fundamentally more green supply chain.

Developing a Green Steel Supply Chain

A sustainable business must be a well-run, efficient, and profitable enterprise; its long-term viability relies upon its relationships with its stakeholders. Whether investors, owners, suppliers, employees, or customers, the aspirations of all stakeholder groups need to be understood and balanced to ensure the long-term success of an organization.

Investors. The business benefits of sustainability are increasingly recognized by investors. Socially responsible investment, increasingly being adopted by large institutional investors, is putting pressure on companies to adopt more sustainable practices. As the financial sector continues to adopt environmental and social issues in its investment decision-making, the message is clear: Companies will increasingly need to demonstrate their sustainable credentials to secure investment.

Financial markets throughout the world now monitor the sustainability performance of companies, and the evidence is mounting that sustainability pays. The Dow Jones Sustainability Index (DJSI), which includes the world's most sustainably managed companies, has significantly outperformed the standard Dow Jones Index in recent years.

Suppliers. Businesses committed to corporate social responsibility are passing this commitment down their supply chains. This means that suppliers are being required to consider, and often improve, their sustainability performance to match the highest standards within their supply chain.

The construction industry comprises many long, diverse, and complex supply chains. As companies implement more sustainable strategies, those suppliers not improving, measuring, and reporting their sustainability credentials to their customers will lose business.

Employees. Awareness of the importance of the social agenda is also increasing. Employees are a central part of any successful sustainable business or sector, and how they are looked after and managed is a key constituent of any corporate sustainability strategy. The health and safety of employees are of paramount importance, particularly within the construction industry, which, relative to most other sectors, has a poor track record. Staff skills, personal development, and retention are also key issues that need to be considered to ensure the sustainability of construction companies.

Customers. Customers are key drivers in implementing change. Not only should companies understand the needs and wishes of their customers, they should also be able to respond by offering new products and services at affordable prices. Everybody uses products supplied by the construction industry. Therefore, as sustainable development becomes more widely and publicly accepted, the construction industry must respond to this new agenda. This challenge represents significant opportunities to the industry.

LEED and Steel

One way in which the steel construction industry can demonstrate seriousness to its stakeholders about sustainability is to engage in the current debate about how to achieve more sustainable buildings and to develop components, methods, and systems that can demonstrate improved environmental performance. The LEED rating system was developed to provide a standard for what constitutes a "sustainable building" and to transform existing building markets so that sustainable design, construction, and operation become mainstream practices. Although LEED should not be seen

Mark Gorgolewski is an associate professor in the Department of Architectural Science at Ryerson University, Toronto, and is also on board of the Canada Green Building Council (CaGBC).

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as the definitive description of sustainable building, there is considerable discussion about its structure and the values it espouses. Currently, LEED is the dominant method for assessing sustainability in buildings, and the steel industry can benefit by showing engagement in addressing the goals as set out in LEED.

LEED offers a third-party certification process whereby points/credits are collected within five main environmental performance categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Environmental Quality. A sixth category deals with the Innovation and Design Process and aims to promote whole-building integrated design practices.

While steel can clearly garner credits in the Materials and Resources category, it can also play a role in the other categories as well (although that role is limited in the Indoor Environmental Quality category and nonexistent in the Water Efficiency category):

Sustainable Sites. This section deals primarily with issues of site selection, design, and access, as well as heat island and light pollution effects.

The wide-spanning capabilities, fast-track construction, integration of services, just-in-time delivery, reduced storage requirements, less disruption on cramped sites, and lighter weight of steel buildings—leading to smaller foundations—all contribute to more workable steel solutions on difficult urban sites.

The use of steel structures and components also allows for much more prefabrication, as a significant portion of the process is removed from the site to controlled factory conditions. Reducing the amount of time spent on-site can lead to less detrimental impacts on the site. And, the development of appropriate prefabrication systems and management systems may allow difficult brownfield sites to be more easily developed.

Energy and Atmosphere. This section deals with strategies to help reduce energy use and protect the ozone layer and includes credits for energy efficiency, renewable energy, purchasing green power, additional building monitoring, avoidance of ozone-depleting materials, and additional commissioning.

Steel structures can be readily designed to achieve the higher levels of energy efficiency required and can score additional points depending on the detail design of the building, its location, and fuel type used.

One issue that is often raised about steel-framed buildings is the lack of thermal mass, which can have a significant impact on commercial buildings. Thermal mass is important in buildings for its heat storage capacity, particularly in the cooling season. However, it is not the absolute amount of mass that is most important, but how well it is distributed and how well it is connected with the occupied spaces. Studies have shown that sufficient thermal mass can readily be incorporated in steel-framed office buildings to reduce cooling loads, and that the structural framing makes little difference to cooling loads (see "Making the Most of Thermal Mass," in the October 21, 1999 edition of *Architects Journal*).

The steel industry needs to develop design guidance for the appropriate integration of thermal mass and exposure of mass in buildings. This means careful specification of finishes to ensure that the mass is not insulated from the internal spaces.

Materials and Resources. This section focuses on building reuse: waste management; reused, recycled, or certified materials; and reducing travel distances for construction materials.

This is perhaps the section that affects the steel industry most, and steel's high recycled content is important in regards to this section; LEED certification requires documentation from the steel suppliers verifying the recycled content and manufacturing process.

However, other attributes of steel construction are also beneficial in this section. The potential for whole steel buildings and individual components to be reused is a major asset here. One of the credits for this category deals with whole building reuse while another awards points for component reuse. Thus, the steel industry should focus its guidance on flexibility and adaptability in steel buildings and the opportunities for deconstruction and component reuse.

When it comes to refurbishment, the ability to modify and reinforce existing structures is an important attribute of steel. There are many examples of steel-framed structures that have been adapted for a new use, and in some cases steel structures have been dismantled and reassembled in a new location. In addition, the lightweight characteristics of steel means that often, additional floors can be added to existing buildings, extending their usefulness.

Many steel components that are recovered from demolition or refurbishment projects are, or could be, suitable for reuse although most currently go to recycling. More components could be readily available if they were initially designed for easier deconstruction. These include structural sections, cladding, studs, and smaller components. Increasingly, designers are sourcing recovered steel components and specifying their use in new projects.

In addition, the use of steel components on-site generates very little waste, as the components are generally manufactured to tight tolerances in a factory and delivered to site for assembly. Thus, using steel components should contribute significantly to reducing site waste.

Another credit in this category is given for the use of "regional materials" in an effort to increase demand for locally manufactured materials, thereby reducing the environmental impacts of transportation and supporting the local economy. A regional material is defined as one that is extracted, processed, and manufactured within 500 miles of the site; if rail or water transport is primarily used, this distance is extended to 1,500 miles. Thus, locally salvaged steel would contribute to this credit, and the steel industry should consider establishing an infrastructure to help designers and contractors identify appropriate local steel.

The credits in this section are calculated using the value of the reused or recycled material compared to the total value of materials. Since steel components often have a relatively high value compared to other building materials, they can contribute considerably to achieving this credit. LEED requires that the salvage status of each component be validated, but if the cost of reused components is lower than the new product equivalent, it allows the equivalent market value of new products to be used in the calculations.

Innovation and Design Process. This section allows a building to obtain up to four design innovation credits, as well as one additional credit for including a LEED accredited professional in the design process. The design innovation may be awarded for achievements such as life-cycle analysis, community development, or education of occupants. Substantially exceeding one of the earlier credits may also warrant an innovation credit.

This is where innovative steel solutions can claim additional "bonus" credits. Possible options include design for future reusability, use of composite members to reduce material volume, use of innovative steel structural solutions that reduce material volume, and integration of structure and services. MSC